WHAT IS CLAIMED IS:

1. A microcapillary hybridization chamber comprising a narrow bore tubing with probe segments, wherein each probe segment comprises oligonucleotide probes covalently attached to the inner wall of the tubing, and wherein the oligonucleotide probes within each segment have identical, known sequences.

2. The microcapillary hybridization chamber of claim 1 with at least 500 probe segments per cm.

3. The microcapillary hybridization chamber of claim 1 with at least 1000 probe segments per cm.

4. A method for performing a hybridization assay between a target nucleic acid molecule and a microcapillary hybridization chamber that comprises:

(a) introducing a hybridization mixture comprising a test sample into the microcapillary hybridization chamber;
(b) incubating the hybridization mixture within the microcapillary hybridization chamber for a time and under conditions sufficient to hybridize a target nucleic acid within the test sample with an oligonucleotide probe attached to the inner wall microcapillary hybridization chamber;
(c) washing unhybridized nucleic acids out of the microcapillary hybridization chamber; and
(d) detecting hybridization between a target nucleic acid and an oligonucleotide probe;

wherein the microcapillary hybridization chamber comprises a narrow bore tubing with probe segments, wherein each probe segment comprises oligonucleotide probes covalently attached to the inner wall of the tubing, and wherein the oligonucleotide probes within each segment have identical, known sequences.

5. The method of claim 4 wherein the target nucleic acid comprises a detectable label.

6. The method of claim 5 wherein the detectable label is a fluorescent molecule.

7. The method of claim 4 wherein the hybridization mixture further comprises a denaturing agent.

8. The method of claim 7 wherein the denaturing agent is formamide, formaldehyde, DMSO, tetraethyl acetate, urea, GuSCN, glycerol or a chaotropic salt.

9. A microcapillary hybridization chamber comprising a narrow bore tubing with probe segments attached to the inner wall of the tubing at predefined positions, wherein each probe segment comprises identical probes.

10. The microcapillary hybridization chamber of claim 1 with at least 500 probe segments per cm.

11. The microcapillary hybridization chamber of claim 1 with at least 1000 probe segments per cm.

12. The microcapillary hybridization chamber of claim 1, wherein each probe segment is selected from deoxyribonucleic acids, ribonucleic acids, synthetic oligonucleotides, antibodies, proteins, peptides, lectins, modified polysaccharides, cells, synthetic composite macromolecules, functionalized nanostructures, synthetic polymers, modified/blocked nucleotides/nucleosides, modified/blocked amino acids, flurophores, chromophores, ligands, chelates, hapten, and combinations thereof.

13. The microcapillary hybridization chamber of claim 1, wherein each probe segment is distinguishable from other probe segments.

14. The microcapillary hybridization chamber of claim 1, wherein each probe segment is immobile.

15. A method for performing a hybridization assay between at least one target and a microcapillary hybridization chamber, said method comprises:

introducing a sample comprising said at lest one target into said microcapillary hybridization chamber;

applying an electrical potential to said microcapillary hybridization chamber with said at least one target;

washing unhybridized said at least one target out of said microcapillary hybridization chamber;

detecting hybridization; and

wherein said microcapillary hybridization chamber comprises a narrow bore tubing with probe segments attached to the inner wall of the tubing at predefined positions, wherein each probe segment comprises identical probes.

16. The method according to claim 15, further comprising increasing the electrical potential above a predefined threshold to denature said hybridization.

17. The method according to claim 15, further comprising applying a range of electrical potentials over time to said microcapillary hybridization chamber with said at least one target.

18. The method according to claim 17, further comprising detecting hybridization at each of said electrical potentials.

19. A method of making a microcapillary hybridization chamber comprising:

providing a substrate wall, wherein said substrate wall is internal to a narrow bore capillary tube; and

attaching a plurality of probe segments to said substrate; wherein each of said plurality of probe segments are spatially discrete from each other.

20. The method according to claim 19, wherein attaching said plurality of probe segments to said substrate comprises synthesizing said probes at specific location on said substrate.

21. The method according to claim 20, wherein said plurality of probe segments are oligonucleotides and said oligonucleotides are attached synthesized at said specific locations on said substrate by light-directed oligonucleotide synthesis.

22. A method for controlling the stringency in a microcapillary hybridization chamber comprising applying an electrical potential to each probe segment in said microcapillary hybridization chamber; wherein said microcapillary hybridization chamber comprises a narrow bore tubing with said probe segments attached to the inner wall of the tubing at predefined positions, wherein each of said probe segment comprises identical probes.

23. The method according to claim 22, further comprising detecting the state of hybridization.

24. The method according to claim 22, adjusting each electrical potential until to eliminate mis-matched hybridizations.

25. A apparatus for detecting hybridization in a microcapillary hybridization chamber comprising:

a microcapillary hybridization chamber, wherein said microcapillary hybridization chamber comprises a narrow bore tubing with probe segments attached to the inner wall of the tubing at predefined positions, wherein each probe segment comprises identical probes;

a detector for detecting hybridization signals in said microcapillary hybridization chamber; and

a computer system operationally coupled to said detector, the computer system comprises a program comprising:

displaying said detected hybridization signals.

26. The apparatus according to claim 25, wherein said detector comprises excitation optics for focusing excitation light on at least one of said probe segments.

27. The apparatus according to claim 25, wherein said program further comprises

determining fluorescent intensity;

removing data outliers; and

calculating the relative binding affinity of said hybridization signals.

28. The apparatus according to claim 25, wherein said program further comprises displaying a image of probe segment colors based on at least one of light emission or binding affinity.